International Journal of Food Properties, 18:638–659, 2015

ISSN: 1094-2912 print/1532-2386 online
DOI: 10.1080/10942912.2013.853185

Taylor & Francis
Taylor & Francis Group

Comparative Spectroscopic Studies on Curcumin Stabilization by Association to Bovine Serum Albumin and Casein: A Perspective on Drug-Delivery Application

Mohammad Mostafa Nadi[1], Mohammad Reza Ashrafi Kooshk[2], Kamran Mansouri[2], Seyyed Abolghasem Ghadami[2,3], Mojtaba Amani[4], Sirous Ghobadi[3], and Reza Khodarahmi[1,2]

[1]*Department of Pharmacognosy and Biotechnology, Faculty of Pharmacy, Kermanshah University of Medical Sciences, Kermanshah, Iran*
[2]*Medical Biology Research Center, Kermanshah University of Medical Sciences, Kermanshah, Iran*
[3]*Department of Biology, Faculty of Science, Razi University, Kermanshah, Iran*
[4]*Faculty of Medicine, Ardabil University of Medical Sciences, Ardabil, Iran*

Curcumin is a natural polyphenolic compound with anticancer, anti-inflammatory, and antioxidation properties. Low water solubility and rapid hydrolytic degradation are two challenges limiting use of curcumin. In this study, the role of the native/modified forms of bovine serum albumin and casein, as food-grade biopolymers and safe drug delivery systems and also protein chemical modification in stabilizing of curcumin were surveyed. Investigation on curcumin stability indicated that curcumin binding to the native bovine serum albumin is stronger than the modified bovine serum albumin, and hence, native protein could suppress water-mediated curcumin degradation. Drug competitive binding, fluorescence resonance energy transfer, and molecular docking studies suggested that the binding site for curcumin has not been changed upon albumin modification. Moreover, different observations were made for both the native and modified caseins. It appears from thermodynamic analyses that in "protein-curcumin" systems, water molecules are excluded from the vicinity of curcumin, so that some of them may provide novel tools to increase both food quality and the bioavailability of curcumin as a health promoting agent.

Keywords: Curcumin, Bovine serum albumin, Casein, Chemical modification, Hydrolytic degradation, Anti-cancer activity.

The first two authors contributed equally to this work.

Received 18 May 2013; accepted 5 October 2013.

Address correspondence to Reza Khodarahmi, Department of Pharmacognosy and Biotechnology, Faculty of Pharmacy, Kermanshah University of Medical Sciences, Kermanshah, Iran. E-mail: rkhodarahmi@mbrc.ac.ir

Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/ljfp.